Vol. XLI, No. 4 Concrete April, 1933

Concrete Masonry Proves Its Value

Large-Scale Tests and Investigations Convince Architects and Engineers—National Standards Find Acceptance—Widespread Publicity to Tell the Story

By BENJAMIN WILK
General Manager, Standard Building Products Co., Detroit, Michigan

FIFTEEN years ago practically no research work had been accomplished in the concrete masonry industry. The products were made with no definite grading of aggregate, with almost any kind of mix, or time of mix, with no special curing methods, and with results that were frequently unsatisfactory. The future of the industry at that time looked very doubtful.

Progress Due to Research

As we think back over what has been done during the past 15 years, we find that much of our progress has been due to the effectiveness of the co-operation among leading manufacturers, in groups such as the Concrete Masonry Association. The research work on the manufacture of concrete products has made it possible for the industry to produce a satisfactory building unit at a reasonable cost. In fact, we may say that we have in the concrete products unit, today, the most economical unit in the masonry field.

The general acceptance of the several specifications developed by the American Concrete Institute, the American Society for Testing Materials, the United States Government, the Underwriters' Laboratories, and the Department of Commerce building code committee, has made it possible for manufacturers to prove to architects and engineers that our units are dependable. Our industry has passed through the infant and adolescent stages. Now we have attained the full growth of an adult industry. When we enter an architect's office, we can approach him with pride in our product—a product that will be for the benefit of his client.

We have only to look at some of the recent buildings to prove this point. All of us can refer with pride to the Berks County Prison at Reading, Penn., where the architects, Alfred Hopkins and Associates, have made effective use of colors in concrete units, and have produced an outstanding example of coursed concrete ashlar masonry. Very recently the same architects used 700,000 concrete ashlar units for the Federal Northeast Penitentiary, at Lewisburg, Penna. There are many examples of large structures in which more than 100,000 units have been used.

The acceptance of concrete units by the general building industry is paralleled by their acceptance in building codes. So far as the Detroit building code is concerned, there is no longer any question of the acceptability of concrete units. Along this line, the data that have been developed on concrete masonry walls during the past few years by the Portland Cement Association and by the University of Illinois with the co-operation of the Concrete Masonry Association, are of vital importance. With these data we are able to convince impartial engineers and architects of the extent to which concrete units can be used. The Concrete Masonry Association has done an outstanding service in assembling this and other important information in the book "Facts About Concrete Masonry." To my mind the production of this book is the high-water mark in the work of the concrete products industry in establishing its product as an acceptable building unit.

The Market of the Immediate Future

The immediate future must be thought of in national terms. The volume of work in the general small house field, for the present, is limited. We do not have the figures for the country at large; but in Detroit, in 1932, homes were built for 310 families, whereas the average for the period from 1915 to 1930 was 13,500 homes annually. In other words, in 1932 we built only 2½ per cent of a 15-year average. In the same year 510 habitations were torn down.

We need the Concrete Masonry Association, today, more than ever. A large part of the construction work in 1933 must come from public buildings. The men responsible for preparing plans and specifications for such work must be convinced that they should think in terms of concrete units, in connection with masonry construction. We know that concrete units mean economical construction, but we must sell specification writers on this idea.

By way of illustration, the U. S. Army is to build a theatre and gymnasium at Selfridge Field, about 25 miles from Detroit. I contacted the quartermaster's office at Selfridge Field, and gave them evidence of the general use of our products in large and important buildings. I even enlisted the aid of architects who had specified our units. As a result of this co-operative work the specifica-

---

Author's abstract of paper read before annual meeting of Concrete Masonry Association, Chicago, Ill., February 23, 1933.

tions were opened to concrete units. Bids were opened February 7, 1933. Whether our units will actually be used in these structures is still unknown, but we do know that the War Department will allow the use of concrete units from now on in all their work wherever structural clay units may be used.

Rehabilitation of Slum Areas

On a national basis we should find a considerable use for concrete building units in low-cost housing, not only for general use but also in rehabilitation of the slum or blighted areas of large cities.

Analysis of the costs of construction and the possible returns in this field show that the most desirable limit of height, from the standpoint of economy, is three stories. We know that it is in structures of this height that concrete units show considerable economy. The downtown sections of most large cities, where the blighted areas exist, are usually within the city fire limits, and that means fireproof construction. Where fireproof construction is needed the desirability of using concrete units is emphasized.

Dammed-Up Demand Developing

We must not let lack of business, today, cripple our facilities for the future. There is no doubt in my mind that one of these days there is going to be a considerable amount of building construction, and a considerable demand for concrete units.

The fact that in the city of Detroit more habitations are being torn down, because of obsolescence, than are being built, is convincing evidence of the trend.

In a paper presented before the Construction League of America, in January, Leonard P. Reaume, former president of the National Association of Real Estate Boards, analyzed the situation as to the supply of housing accommodations, and came to the following conclusions:

First, that it is unlikely that many apartment houses accommodating large numbers of families will be built for a number of years, primarily because those that have been built during the last ten years have not been profitable, and secondarily, that the method of financing most of the apartment house construction during the last ten years will not be repeated.

Second, with the tremendous losses taken in nearly all classes of investments and speculative ventures, as the result of recent events, the American people have been sobered in their judgment, and will undoubtedly turn to the purchase of modest individual homes for the comfort and protection of their families.

This merely points to the fact that there is being developed a dammed-up demand which must some time be met. A conservative estimate of the average annual demand for homes in the larger cities in the United States, under normal conditions, is approximately one-half of one per cent of the population. On this basis, Detroit, with a population of one and a half million, should construct, with a nominal increase in population, 7,500 habitations annually. Compare this with the 310 habitations built in 1932.

The concrete masonry industry is alive to new ideas in house construction, as evidenced by the progress in the use of concrete ashlar masonry, and by the use of various finishes, such as paint and stucco, on the usual 8 by 16-in. units. Around Detroit there are a number of examples of the effective use of concrete units for above-ground walls for various size residences. No doubt there are many good examples all over the United States. These can be used as the basis for a real campaign for the intelligent use of our units by architects who want to build something attractive, but at the same time economical.

Widespread publicity about the developments in the use of concrete units for above-ground walls, for back-up, for partitions, and for exterior walls, would add tremendously to the demand for our product.

The Opportunities Ahead

Here, then, are some of the opportunities ahead for the Concrete Masonry Association.

1. To get concrete building units specified in all federal, state and municipal government buildings, at least as an alternate with other masonry materials.
2. To convince the public, the architects, the engineers, and the products manufacturers themselves, of the splendid results that can be obtained by using concrete units for above-ground walls. Such publicity should be along the line of stories in magazines describing outstanding jobs, advertisements, pamphlets, and regular communications to products manufacturers.
3. To study the economy in using concrete units for low-cost housing.
4. To obtain proper recognition for our units in building codes.
5. To co-operate with other associations and technical societies in developing specifications.

If we are to achieve what we can see ahead of us, if we are to progress as an industry and take advantage of our superior product, the Concrete Masonry Association must be supported whole-heartedly, to the end that architects will select our product as a superior building unit, well adapted to the highest form of architectural expression.

Vibration to Be Principal Subject of Vault Makers' Meeting

What is expected to be one of the outstanding annual meetings of the National Concrete Burial Vault Association will begin with a directors' meeting on the evening of May 17. Registration will begin on the succeeding morning, to be followed by the address of welcome and a response by President Ross Hilles. Report of the secretary-treasurer, election of three directors for a term of three years, and appointment of committees will also take place at this time.

The afternoon will be spent in the laboratories of the Case School of Applied Science, where a vibration demonstration will be conducted by Mr. W. D. M. Allan of the Portland Cement Association. The convention body will then assemble for a lecture by Professor Danforth on the subject of vibration and its possibilities and a discussion led by Mr. Allan on the results of his demonstration.

A banquet for vault manufacturers and guests will be held Thursday evening.

The following day's session will be given over to sales and advertising talks, manufacturing problems and a general round-table discussion, including the subject of curing.

How Highway Work in Upper Michigan Provides Unemployment Relief

Engineer Estimates 20.3 Per Cent of Population Benefited—Organization of Work—R. F. C. Loan Obtained

By J. T. SHARPENSTEEN
Division Engineer, Michigan State Highway Department
Escanaba, Michigan

IN the upper peninsula of Michigan, according to the 1930 census, three basic industries—mining, agriculture and lumbering—named in the order of importance from an employment standpoint, furnished 45 per cent of all employment at that time. Out of a total of 117,000 persons gainfully employed, 52,000 depended on these three industries.

The Size of the Problem

Two of these industries, mining and lumbering, have shown a continual falling off in production since 1929, until now a very large percentage of those normally employed have been forced to seek other means of obtaining a living, and those who still depend on these two industries are obtaining only part time employment. Taking the 1930 census, 34,000 people engaged in mining and lumbering, out of a total population of 319,000, have either been thrown out of employment completely, or have had their earnings reduced by part time employment to a point where further reductions will mean at least partial dependence on charity.

Along with the decrease of employment in mining and lumbering, there has been a parallel decline in employment in all other industries, except possibly agriculture. Added to the unemployment caused by the stagnation of industries at home, there has been an influx of the unemployed from the large industrial centers. Perhaps the best evidence that the ranks of the unemployed have been materially augmented from this source is the fact that in 1929 there were many abandoned houses in the upper peninsula, while today it would be extremely difficult to find an empty house in the rural sections, where home abandonment had been the greatest. People returning from the industrial centers have taken advantage of the empty houses to reduce or eliminate rent entirely, and in practically all cases the savings of these people have already been spent in providing food and clothing. They, along with a big majority of those who have been engaged in local industries, must have relief either directly or through employment.

The Michigan state highway department recognized the possibilities of providing relief through increasing the number employed on highway construction and maintenance, and in the last six months of 1931, materially increased the construction program. Provisions were made to insure the maximum relief consistent with reasonable efficiency. Limitations were placed on the amount of power equipment which a contractor might use. Provision was made requiring the contractor to pay a minimum wage, to rotate a large percentage of the number employed, and to secure these men through the county unemployment committee, insuring a more judicious distribution of work among the most needy.

Before completion of the work authorized in the latter part of 1931, it became evident that additional work relief would have to be provided to supplement the work relief provided by local political units and the work of the welfare organizations. This situation was met in part by authorizing the construction of 41 state highway road and bridge projects. On acount of the lack of surveys, plans and right-of-way, considerable delay was experienced in putting some of these projects under contract. More rigid labor requirements govern the contracts than was the case with the 1931 program. A minimum wage rate has been established, as before, and 30 hours per week has been set as the maximum time of employment. This latter provision insures an even wider distribution of labor than that obtained under the previous year's plan.

Obtain Highway Funds Through R. F. C.

Before the end of 1932 it became apparent that the state highway program plus all other work relief activities plus the resources of welfare organizations would not be adequate to prevent intense suffering during the next few months. At a meeting of county highway officials and other interested parties, held at Munising in November, under the auspices of the Michigan Trades Recovery Committee, the State Highway Commissioner proposed to pledge future Federal Aid for highway construction to secure a loan of $2,000,000 from the Reconstruction Finance Corporation, to be used in improving state highways in the upper peninsula during the next nine months. Application for a loan of approximately $380,000 for the months of January and February was approved, and the money is being expended in all counties except those where weather conditions make it impracticable to do much highway work during the winter months. In these counties direct relief is being given, for which labor will be furnished as soon as weather conditions will permit.

At the time the $2,000,000 loan was proposed, it was estimated that 8,000 men could be given employment on state highways. At $2.00 per day per man the amount would be sufficient for 125 days for the entire number;

Author's abstract of paper presented before Annual Conference on Highway Engineering, at University of Michigan, Feb. 15, 1933.

but by rotating and working roughly half time, the 8,000 men can be kept employed for 250 days, which, counting Sundays and holidays, approximates nine months.

Since October, 1931, an accurate record by semi-monthly periods has been kept of the number of persons employed on the construction and maintenance of state highways in the upper peninsula. The record since November 1, 1932, shows the following numbers who were thus given gainful employment:

First half of November	2,331
Second half of November	2,238
First half of December	1,701
Second half of December	1,572
First half of January	1,348
Second half of January	4,610
First half of February	7,117
Second half of February	6,300

Work Supplied for 28,000

It has been estimated by the statistical division of the state highway department, that 14,000 men received work through the first two relief programs. This is undoubtedly a very conservative figure. In some of the larger counties crews were rotated three times a week, in others twice a week and in the remainder once a week. Too much weight should not be given, however, to the frequency of rotation in estimating the total number employed, since a man receiving two days work a week every week is better off than one receiving three days a week and only working one or two weeks out of a month; and in the latter case, a greater number will be used in doing a given amount of work.

The unemployment relief afforded by work on state roads represents 50 per cent or less of the relief provided through highway work. The counties, townships, cities and villages have turned to highway work as one of the best means of providing work relief. In several of the larger counties the number employed on county roads alone far exceeds the number that has been employed on state roads. It is extremely conservative to say that only half of the relief through highway work was furnished by the counties, townships, cities and villages; but using that figure as a basis for determining the total number employed on highway work we find that at least 28,000 people have found employment on the roads.

Benefit 64,000 People

Using the 1930 census figures, which show 117,030 persons gainfully employed, and dividing that number by 69,703, which was the number of families at that time, it can be determined that 1.68 persons per family contributed a part or all of their earnings to the maintenance of the family. Dividing 28,000, the total estimated number used on highway work, by 1.68 we find that about 17,000 families were affected. Now using the number of families involved and multiplying by 3.86, which is the median size of all families in the upper peninsula, we find that about 64,000 have received direct benefit from road work. This is 20.3 per cent of the entire population. By following the same line of reasoning it can be determined that mining, the largest industry, was affecting directly in the spring of 1930 only 13.54 per cent of the total population.

In using the median size of families, it is believed the results are less than the actual facts. The unemployment committees try to select the most needy, and it can be safely assumed that the need will vary directly as the size of the family. Granting that as being true, it is evident that those who have worked represent families larger than the median size. There are 468 families having twelve or more members, 2,097 having ten or more members, and 11,128 having seven or more. In all probability a major portion of the number employed came from these large families, which would materially increase our estimate of the total number who have received direct benefits.

Summary of Benefits

To sum up the results of relief through highway work, it can safely be said that the resources of the local political units have been conserved instead of being depleted; that better highways have been provided; that no small amount of suffering has been averted; that the morale of the people has been kept on a higher level, and that the agitator has been denied a fertile field for his propaganda. While it could not be expected that any one activity would provide all the relief needed, it can be said that relief through highway employment has played an important part in the general scheme of relief, and it is to be hoped that the depression will have run its course and the unemployed will have been absorbed in the various industries before the funds for highway work are completely exhausted.

Association Appoints W. D. M. Allan Director of Promotion

Kaiser, Former Assistant, Is Appointed Manager of Products Bureau

W. D. M. Allan, since 1926 manager of the cement products bureau of the Portland Cement Association, has been appointed director of promotion, according to an announcement made by Wm. M. Kinney, general manager of the association.

The appointment gives Mr. Allan the responsibility of planning and directing the work of the following six departments: Advertising and Publications, General Educational, Cement Products, Highways and Municipal, Railways, and Structural bureaus.

W. G. Kaiser, assistant manager, cement products bureau, for over 10 years, is named manager to succeed Mr. Allan. These changes became effective March 22.

Mr. Kinney also announces that C. R. Ege, manager, advertising and publications bureau, has been appointed assistant secretary of the association, by the board of directors.

Both Allan and Kaiser are well known to the concrete industry. The former has been intimately associated with work of Portland Cement Association, American Concrete Institute, Concrete Masonry Association, National Ready Mixed Concrete Association, and other similar organizations, both local and national, since 1918. The latter, one of the original employees of the cement products bureau, advancing from agricultural engineer to assistant manager, also is a past president of the American Society of Agricultural Engineers.

The Engineer Versus the Laboratory in Ready-Mixed Plant Control

By D. G. DUPUY
Engineer of Design and Tests, Ryan Ready-Mixed Concrete Corp., Brooklyn, N. Y.

Commercial Laboratories Start Industry Off on Right Foot—Advantages and Disadvantages of Laboratory Supervision—Why Plants Need Own Engineer

BEFORE the days of the ready-mixed concrete plant, anybody could, and did, make concrete. So many buggies of stone, so many of sand, a few bags of cement, and some water, made a batch of concrete; just as a pinch o' this and a pinch o' that mixed with flour and skimmed milk made boarding house biscuits. There was nothing certain about either product, and it would hardly be going too far to say that in not a few instances one could be exchanged for the other, not alone to the benefit of the boarder but to the structure as well.

What progress has been made in the gentle art of biscuit-making is not known to this writer, who in passing takes the liberty to observe that if those engaged in the culinary arts have kept pace with the concrete producers, their product has shown improvement, for concrete is no longer batched by hit or miss methods.

Commercial Laboratories Called In

With the first ready-mixed concrete plant came the problem of producing quality concrete consistently. Contractors and engineers, learning that it was available, demanded it; and it was up to the producers to supply it. Many operators of concrete producing plants found themselves with a manufacturing unit on their hands but with no one in the organization who was sufficiently familiar with the product it was designed to produce, to make it tick properly.

It was at this point that the commercial laboratory was called in to design the mixes, and in most cases to control the output. After the laboratories took charge it was fairly smooth sailing for the producer; his plant under the guidance and control of the laboratory inspector was turning out consistently good concrete, but there was something yet lacking. The "pinch o' that" had been left out of the plant owner's biscuit; there was nothing definitely wrong with the taste—it simply seemed to lack that something which would make it completely satisfying.

Changing Inspectors Too Frequently

A brief survey by the plant owner brought to light the fact that he was paying out of his pocket approximately \$300 per mo.* for laboratory service, and in addition to that, certain sums each month for the testing of cylinders and cements. In return he was receiving full time service from the inspector supplied by the laboratory at a salary approximately 50 per cent of the fee paid to the laboratory.

Looking further, the plant owner discovered that it was quite unlikely that the laboratory could obtain a competent man in the metropolitan area for a sum less than the total fee charged by the laboratory. This discovery accounted for the many changes in inspectors at the plant, and also for the competence or incompetence of the inspectors. The inspector of experience and sufficient ability to direct operations moved on sooner or later because the laboratory could not afford to pay, out of the fee received from the client, sufficient salary to hold him.

Seldom, if ever, was he replaced by an inexperienced man, because no laboratory could afford to assign an incompetent inspector to a client's plant. If such a thing occurred the man was promptly removed as soon as his deficiencies were brought to the attention of his employers. Here again the plant operator found himself with a new man in his plant and the game of drop-the-handkerchief going merrily on while he grew dizzy in his efforts to keep his eye on the handkerchief. In addition, the owner found that his plant was being operated by an agency over which he could exercise no direct control.

This fact alone prevented the plant owner from taking the laboratory representative fully into his confidence in matters pertaining to new contracts, for regardless of the reputation of the laboratory, the plant operator could not afford to run the risk of a leak where such a leak might very easily mean the loss of a contract to a competitor.

Plant Needs Its Own Engineer

Consequently, it is not difficult to understand why, after carefully considering the facts, the plant owner determined to place on his payroll an engineer capable of designing concrete mixtures and controlling the output. An engineer capable of assuming full charge of a plant could command a salary approximating the fee charged by the laboratory; but his usefulness to the plant would, if he were a member of the organization, be immediately increased. The scope of his work would be broadened and the plant would benefit accordingly.

Holding the Customers' Confidence

In retaining an independent engineer, the plant owner was faced with a problem as great, if not greater, than the problem of the changing inspectors. He was uncertain of his customers' reaction. There were, then, only two courses left open to him:

1. He could first go to those customers who demanded laboratory supervision of his plant and ask their consent to the change.
2. He could make the change and then wait for the fireworks to start.

Being cognizant of the value of the laboratory service as an aid to selling, the first plan appealed more strongly than the second, and it is safe to presume that he approached his customers from that angle. It is not supposed that his sales talk did the laboratory as a supervising agency any particular good, inasmuch as he was out to save money for himself and at the same time replace a service that had proved satisfactory to the customer, with a service that would meet not only the exacting demands of his customers but his own needs as well. In any event the laboratory as a supervising agency has been discarded in favor of the independent engineer, employed on a full time basis by the concrete producer. Three of the largest plants producing ready-mixed concrete in greater New York are now operating on this plan with marked success, and there is no indication of a return to the laboratory.

---

*Average charge for laboratory supervision in New York City in 1932.

Laboratories Deserve Much Credit

If those who are engaged in this work are to make a success of it and through initiative and ability improve on the laboratory service, they should not lose sight of the excellent work performed by their predecessors. The credit for starting the ready-mixed concrete industry off on the right foot is due largely to the commercial laboratory, and the engineers who have taken up the work where the laboratory left off will do well to be guided by the high standard of ethics observed by them in dealing with their client and with the client's customers.

It is unfortunate that the laboratories could not devise some means of overcoming the difficulties outlined here, but it should not be supposed that their usefulness to the concrete industry is at an end. On the contrary, the plant operator can use the laboratory to even greater advantage than before, and he should never hesitate to avail himself of their excellent services when the need arises. The principal thing to be considered in the operation of a concrete plant and the employment of a laboratory, is to determine where the laboratory can be used to the greatest advantage, and when the limit of its usefulness has been reached.

Hens Favor Concrete Floors in Poultry Houses

Hens like a cool temperature on a hot day and will leave a house with a wooden floor in order to snuggle down to the surface of a concrete floor to bring their bodies in contact with the cool surface. This helps to keep down mortality in hot weather.

Concrete floors are cooler than wooden floors in hot weather, due to the effect of the soil underneath. For the same reason, they are warmer than wooden floors in cold weather and have an appreciable influence in equalizing the temperature of the room.

These are the conclusions from tests reported in a recent bulletin from the Agricultural Experiment Station at College Park, Md.

World's Fair Exhibit of Concrete Machinery, Materials and Accessories Proposed

Building Available Near an Entrance to Century of Progress Exposition in Chicago—Would Display Machinery in Actual Production

By **WALLACE R. HARRIS**
Milwaukee, Wis.

IT has been 21 years since we had a Cement Show. Members of the concrete industry have often asked why.

It is now proposed to answer the question by placing an exhibit of concrete machinery, materials and accessories in a building located on the north side of 29th Place, between South Parkway and Calumet Ave., Chicago, near one of the entrances to the Century of Progress Exposition, scheduled to open on June 1.

The floor space in this building is free from posts. Ample clear height permits the operation of tampers.

Machinery in operation has always made a strong appeal to prospective buyers. Many concrete products plants are now in need of revision. New machinery, and repair parts for good machinery now in place, are needed. Economy in factory costs is of prime importance to products manufacturers who have survived this eventful period.

Estimates place the number of visitors to the Century of Progress Exposition at 50 million. Several thousand of those visitors will be manufacturers of concrete products. What they need, so far as their own industry is concerned, is an exhibit where they can see modern machinery and modern methods in actual operation, producing all kinds of concrete products. That is what the proposed exhibit will provide.

Rules and regulations governing exhibits have been issued and distributed to members of the concrete industry. In these rules the word "machinery" is given a broad meaning, so as to include any machines, mixers, molds, products, materials, or other physical property used in the concrete industry.

Anyone desiring further information, or a copy of the rules, should address the writer in care of the Knickerbocker Hotel, Milwaukee, Wis.

Earthquake Again Proves Efficiency of Concrete Construction

California Cities Provide Test for All Types of Construction —Investigators Predict Greater Use of Monolithic Concrete and of Cement Mortar

THE disastrous earthquake that struck southern California on Friday, March 10, at 5:54 p. m., centering on Long Beach, has again demonstrated the lessons taught by previous earthquakes—namely, that certain types of construction are capable of resisting earthquake shock while others are not.

Favored Materials Collapse

The unfortunate feature of the story of the latest disaster is that the prevailing types of construction employed in the affected area for the vast majority of small and moderate-size buildings such as dwelling houses, apartment houses and business buildings, were types that failed as completely in previous earthquakes as in this one. Unwarranted propaganda had succeeded in concealing the facts from the public, and even insurance companies were misled into making earthquake insurance rates favorable to the very materials that developed widespread collapse in Long Beach and surrounding cities and towns.

The area in which serious structural damage occurred has Long Beach at its center. It extended inland to Whittier and Santa Ana, north to the main business section of Los Angeles, and south to Newport Beach. The most severe damage occurred in the cities of Long Beach, Compton, Watts, Huntington Park, Santa Ana and Huntington Beach.

Concrete Buildings Resist Shocks

Among the various types of construction used for the larger buildings, those having reinforced concrete structural frames and those with structural steel frames that were fireproofed with concrete and were braced and stiffened with walls of reinforced concrete, withstood the earthquake shocks without damage. In contrast, structural steel-framed buildings that were fireproofed with clay tile and had panel or filler walls of the same material swayed to an extent that cracked up many of the panel walls and interior plaster and partitions, and knocked off cornices and trim of terra cotta and stone. This is precisely what happened in the Japanese earthquake of 1924, the Santa Barbara earthquake of 1925, and in the Miami and Cuban hurricanes of 1926.

Small buildings of monolithic concrete were comparatively few in the affected area; but their performance was admirable, for they came through the quake without damage.

Extensive Failure of Brick and Tile

Clay brick and clay tile construction have been used almost exclusively throughout the affected area, for small buildings of all kinds of occupancy. Hundreds of these buildings suffered total collapse, and many more were seriously damaged. One serious trouble with this type of construction is that it violates the fundamental requirement of continuity for successful resistance to earthquakes.

Part of the trouble with clay masonry resulted from the common practice of permitting the use of untempered lime mortar in walls of this material. In the collapsed heaps of this masonry the lime mortar appears white, chalky, and almost devoid of strength. If the use of this form of masonry construction is to continue, it is obvious that either cement or cement-lime mortar must be used. This is indicated from the occasional examples of undamaged brick masonry in large buildings, where this better mortar was used. It is possible, also, that the results of the quake will give impetus to the use of reinforced masonry—a practice that is quite possible, but which has the disadvantage of high cost.

Random Concrete Ashlar Undamaged

An interesting example of the efficiency of random concrete ashlar masonry is seen in the excellent performance of this type in the 2-story First Baptist church structure in Huntington Park. The building appears to be in perfect condition, though Huntington Park was severely affected. It is believed that the offsetting of the ashlar units and the absence of continuous horizontal mortar joints, together with the use of cement-lime mortar, made this type of masonry highly resistant to the shearing forces induced by the quake.

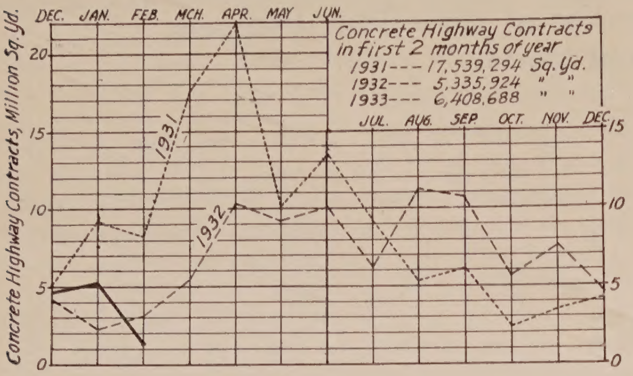
Greater Use of Concrete and Cement Mortar

Unquestionably, this earthquake will result in a much more extensive use of concrete and of cement or cement-lime mortar throughout the Pacific Coast, in the construction of buildings. Buildings of reinforced concrete have repeatedly demonstrated their ability to resist severe earthquake shock, due to their continuous construction. Masonry laid in cement mortar, and supported on concrete foundation walls that are properly tied together, likewise have a good record. For large buildings, two types of structural frame have proved their worth. These two are the reinforced concrete frame and the structural steel frame fireproofed with concrete. In each case the floors should be of reinforced concrete, and the exterior panel walls and principal interior stiffening walls should be of the same material.

Architects and engineers may look upon the southern California earthquake as a large-scale laboratory test, and they should be governed by the facts that have been brought out so clearly; and in general, the same lessons may be applied to regions affected by hurricanes and tornadoes.

February Highway Contracts at Low Level

Contracts awarded for concrete construction in February fell to 1,279,626 sq. yd., after making a promising start in January, according to figures compiled by the highways and municipal bureau of the Portland Cement Association.



Copyrighted by Concrete Pub. Co. To be reproduced only by permission.

The small yardage awarded in February is believed to be in part due to the many changes in state administrations, accompanied in some important instances by changes in highway department personnel.

Distribute 100,000 Broadsides on Low-Cost Fireproof Home

An exceptionally effective aid toward the revival of dwelling house construction is seen in a large and well illustrated broadside recently issued by the Portland Cement Association.

The broadside tells at a glance the story of the fireproof home—what it is, how it is built and how it may be obtained.

Nearly 100,000 copies have been distributed to architects, engineers, contractors, and building and loan associations, as a means of crystallizing interest in concrete masonry and concrete floor construction.

Coming Conventions

June 19-22—National Terrazzo and Mosaic Association, Inc. Palmer House, Chicago, Ill.

May 18-19—National Concrete Burial Vault Association. Statler Hotel, Cleveland, Ohio.

June 21-24—American Society of Agricultural Engineers, 27th annual meeting. Purdue University, Lafayette, Indiana.

June 26-30—American Society for Testing Materials, annual meeting. Stevens Hotel, Chicago, Ill.

June 26-July 1—American Society of Civil Engineers, annual convention. Chicago, Ill.

Increase Use of Concrete in South Africa

A letter to Concrete from Lyle A. Brookover, assistant chief, foreign construction division of the U. S. Department of Commerce, mentions a report from the Johannesburg office of the department to the effect that utilization of concrete in the South African Union is expanding rapidly.

The report expresses the belief of the Johannesburg office that the situation offers a market to American manufacturers of concrete construction machinery and specialties.

Terrazzo and Mosaic Members to Meet at Chicago

Members of the National Terrazzo and Mosaic Association, Inc., will meet in annual convention at the Palmer House, Chicago, Ill., on June 19 to 22.

Plans for the program are now being made by a Chicago committee, according to U. F. Durner, secretary, Milwaukee, Wis.

✦ PERSONALS ✦

Warren R. Bruce, formerly sales manager and chemical engineer for the Barnsdall Tripoli Company, has opened an office in St. Louis for the purpose of carrying on consulting work in chemical engineering, with special attention to its application to construction materials and methods.

George E. Warren has been appointed vice-president and manager of eastern operations by the Southwestern Portland Cement Co., at Osborn, Ohio.

He was formerly assistant general manager of the Portland Cement Association.

Fred E. Swineford, chief engineer for the Ohio Crushed Stone Association, 407 Hartman Building, Columbus, Ohio, was elected president of the Ohio Engineering Society at the annual meeting of that society, held at Columbus in conjunction with the County Commissioners' Association on February 7, 8 and 9. Mr. Swineford was formerly director of public service at Akron, Ohio, and chief engineer of maintenance for the Ohio State Highway Department.

Col. William G. Hudson, district engineer for the Portland Cement Association at New Orleans and a member of the staff of Governor Allen, of Louisiana, accompanied the governor to Washington to attend the ceremonies in connection with the inauguration of President Roosevelt.

Develop Wood-Cement Mixtures

German patent No. 551,835 has been issued to O. Morgenroth, covering a wood-cement mixture consisting of a filling material such as sawdust, an inorganic aqueous emulsifying agent, bitumen emulsion, and a hydraulic binder such as portland cement. Copies of the patent may be obtained at 1.00 Mark each (24 cents) by addressing Reichspatentamt, 103 Gitschinerstrasse, Berlin, S. W. 61, Germany, and mentioning the patent number.

◆ EDITORIAL ◆

Construction That Resists Earthquakes

THE earthquake that shook Long Beach and surrounding California cities and towns on March 10, with a resulting loss of 119 lives and 50 million dollars in property, was a shock of major intensity, measuring from VIII to X on the Rossi-Forel scale.

This disaster again proves that certain types of construction are capable of resisting major earthquakes, and that other types are not. The quake also provides a large-scale demonstration of the difficulty of educating the building public, for the prevailing types of construction employed throughout the affected area for small buildings are the very types that should never be given a moment's consideration in regions threatened with seismic disturbances.

The facts that have been so completely demonstrated at Long Beach were demonstrated just as completely in the Santa Barbara earthquake of 1925 and the Japanese disaster of 1924. Yet the general building public can not be wholly condemned for failing to learn its lesson the first time, when one recalls the flood of misleading propaganda that was turned loose after the Santa Barbara quake. Even the insurance companies operating on the Pacific Coast were misled into issuing rates favoring types of masonry construction that proved wholly inadequate on March 10, and for several years rates were maintained that were unfavorable to the reinforced concrete structural frame, the type that is soundest of all.

Now that a major shock has occurred in a metropolitan section inhabited by 3,000,000 people, it is probable that the public will draw its own conclusions without assistance from sources of false propaganda.

Foremost among these facts is that for large buildings, the reinforced concrete structural frame and the structural steel frame fireproofed with concrete and having reinforced concrete panel walls and principal interior walls, are the only two types worthy of consideration. Small buildings of monolithic concrete also performed admirably.

Ordinary masonry laid in continuous horizontal joints should not be permitted unless reinforced, and all masonry should be laid in cement or cement-lime mortar. Random ashlar masonry, with horizontal as well as vertical joints broken, proved entirely satisfactory. Foundation walls of all buildings should be of monolithic concrete and should be tied with reinforcement into continuous construction.

The facts just enumerated are easy to understand, for they are based primarily on common sense; and for the most part they apply with equal force to sections affected by hurricanes and tornadoes, as the Tennessee tornado of March 14 has again proved.

Benefit may come from the Long Beach disaster if its lessons are translated into improved construction practice and adequate building laws.

No Room for Factory-Built Homes

A FLOOD of premature and superficial newspaper publicity concerning remarkable new types of factory-made houses, to be produced and erected on a mass production basis, has caused potential home builders to hold back in the hope of taking advantage of the great saving in cost that is invariably promised.

This was the consensus among representatives of the building industry who held a preliminary meeting in Chicago several weeks ago—a meeting that resulted in the decision to call a national conference for the purpose of setting the facts before the public. It is expected that the national conference will be held in Chicago in April, and that it will be attended by representatives of concrete and concrete products, and various other branches of the home-building industry.

Committees planning this conference hope to draw out frank discussions of methods whereby much of the waste of present practice may be eliminated. It is generally agreed that financing costs offer the greatest single opportunity for saving, and that another important source of waste arises from the fact that so many different subcontractors—all trying to make a profit—are involved in the construction of a small dwelling house.

The April conference hopes to drive into the public mind the fact that there is no room in this country for the standardized, factory-built home, that changes in home building come gradually, and that standard building methods and materials which have been used for thousands of years will continue in use for a long time to come. As the building industry progresses, methods will be improved and materials will be used more efficiently and economically; but there is no evidence to indicate the early development of revolutionary changes in home building. The so-called factory-made houses exist only in pretty plans and pictures, as the prospective home owner will soon learn if he tries to get one of them built.

Leaders of the concrete masonry industry and builders who contemplate specializing in the construction of fireproof concrete homes could contribute much to the discussions in the forthcoming conference, which is sponsored by Henry A. Guthrie, of the Millar Housing Letter organization.

PROGRESS—In a Page

Current activities in research, in matters pertaining to concrete and cement, as being carried on or completed by various organized groups.

Master Color and Texture Samples of Cast Stone

THE commercial standard covering colors and finishes for cast stone, submitted in 1932 by the Cast Stone Institute as a proposed Department of Commerce standard, was printed in part in the July (1932) issue of CONCRETE, page 12. Reference to the distribution of samples appears in the August (1932) issue, page 16.

The proposed standard is now being revised by the National Bureau of Standards. The revision was sent out by the Bureau under date of February 25, 1933, and under the designation of TS-1856. This revised copy supersedes the former standard TS-1689, sent out on June 1, 1932.

Announcement is made to the effect that master color and finish samples are maintained at the Bureau of Standards and at the office of the Cast Stone Institute. Reference samples have been placed in the construction departments of several federal offices. Manufacturer's samples certified as conforming to the proposed standard color and finish samples are now available to established manufacturers from the Cast Stone Institute. Manufacturers should prepare themselves promptly to furnish cast stone according to the proposed standard reference samples, if they desire to obtain the maximum advantage of the work of the Cast Stone Institute in this direction.

According to present plans the standard reference sample system will be given a trial for a reasonable period and if found to provide a satisfactory method for specifying colors and finishes of cast stone, a general conference of all interests of the industry will be held to consider the system as a basis for the establishment of a commercial standard.

Further information concerning the reference samples or the standardization program may be obtained from G. W. Wray, of the division of trade standards, National Bureau of Standards, Washington, D. C., or from C. G. Walker, assistant secretary of the Cast Stone Institute, 33 West Grand Avenue, Chicago, Ill.

A. S. A. Approves Revised Standard for Spiral Rods

THE revised American Standard on Steel Spiral Rods for Concrete Reinforcement (A38-1933) (Simplified Practice Recommendation R53-32) has been approved by the American Standards Association. This is a revision of the former American Standard A38-1927, the revision consisting largely of a rearrangement of the tabular form in which certain data are presented, and the removal to tables in an appendix of other data now given for informational purposes.

The revision has been accepted by industry under the procedure of the division of simplified practice of the National Bureau of Standards as a revision to Simplified Practice Recommendation R53-26. The National Bureau of Standards and the Concrete Reinforcing Steel Institute are joint sponsors for the project under the procedure of the American Standards Association.

Preparing Specifications for Concrete Non-Load-Bearing Units

THE American Society for Testing Materials Committee C-10 on Hollow Masonry Building Units is devoting much of its attention at this time to definitions of the term "cells" and the expression "hollow masonry building units," both of which concern structural clay tile and concrete masonry units. In the current specifications, the only restrictions on the design or shape of units are those of outer dimensions, number of cells, and weight. The many possible arrangements and sizes of the cells result in uncertainty as to whether some of the designs now being marketed meet the requirements of the standards. The subcommittee on concrete units is preparing specifications for non-load-bearing units and the subcommittee on definitions has prepared proposed definitions of terms applying to concrete masonry units.

Continue Cinder Unit Research at Bureau of Standards

FOR more than two years the National Building Units Corporation has maintained its research work at the U. S. Bureau of Standards through the work of E. W. Bowen, research associate. This work was inaugurated in the latter part of 1930, as was mentioned on this page in the November (1930) issue of CONCRETE.

The investigation includes a study of the characteristics of cinders and the relation of their characteristics to their concrete-making qualities. Information gained from the investigation is distributed to manufacturers in the form of special reports.

Building Code Progress at Boston, New York and Chicago

THE proposed new building codes for New York City and for Chicago, under preparation for the past four years, are both in the hands of the city legislative bodies.

In Chicago weekly hearings are being held by the city council committee on code revision, and fair progress is being made. In New York the proposed code was submitted to the board of aldermen by the mayor on November 22, 1932, and was referred to the committee on buildings. Due to the change in the city administration in January, and the problems which have developed since then, the committee on buildings has not seen fit to call the code up for public hearings.

The proposed new city building code for Boston is being reviewed by the general code committee, and recommendations for changes are being referred back to the various subcommittees. No definite time has been set for submitting the code to the city council.

Co-ordination of Basic Principles of Concrete Mixtures

Study of Surface Area, Surface Modulus and Fineness Modulus of Aggregates Concludes Review of Mixture Research in Twelfth Article of Series

XII—Needed Laws of Mixtures and Known Fundamentals; Review of Concrete Mixture Research (Concluded)

By **JOSEPH A. KITTS**
Consulting Concrete Technologist, San Francisco, Calif.

THE present article concludes the author's review of concrete mixture research, with a study of the significance of the surface area, the surface modulus and the fineness modulus of aggregates, and the relations existing between them. The next chapter will deal with supplementary principles and co-ordination.

Surface Area, Surface Modulus and Fineness Modulus

In a paper entitled "Proportioning the Materials of Mortars and Concretes by Surface Areas of the Aggregates," *Proceedings*, A. S. T. M., Vol. XVIII, Part II, 1918, L. N. Edwards presented methods of determining the surface area of aggregates, and proposed the ratio of cement to surface area as a more scientific basis of proportioning mortars and concretes than cement to arbitrary bulk volumes. While this idea was original with Mr. Edwards and the first technique of application to mortars and concretes was developed by him, he later discovered that the same idea was described in "A Manual of Lime and Cement" (1893), by Prof. A. H. Heath, whom he quotes:

"Sufficient cement should be used to furnish a coating to the surface of each particle of the matrix, and the extent of the surface of particles as compared with their bulk is much greater with fine sand than with coarse sand.

"To ensure the perfect coating of each particle, a larger proportion of cement must be taken with fine than with coarse sand. If the proportion of cement taken for fine sand be that sufficient only for coarse sand, the cement films enveloping the particles will probably be imperfect, and the concrete will be deficient in strength."

Professor Heath had reference to sands composed of particles naturally graded in sizes from zero diameter to a comparatively small maximum size for "fine" sand, and to a perceptibly larger maximum size for "coarse" sand, for example, 0 to 1/8 in. and 0 to 1/4 in., respectively. With naturally rounded sand grains in each case, the smaller size requires more cement and water than the larger size for mortar of given plasticity and strength; the 0 to 1/8-in. sand particles have perhaps 50 per cent more aggregate surface area for a given absolute volume of rock solids than the 0 to 1/4-in. sand. Further, crushed rock aggregate of the 0 to 1/4-in. size requires more cement and water for mortar of given plasticity and strength than the same screen size grading and absolute volume of 0 to 1/4-in. sand of rounded particles of the same character of rock; the angular particles have greater aggregate surface area than the rounded particles for a given absolute volume of rock solids. Under comparative conditions of plasticity of mix, similar grading and lithological character of rocks, there is very consistent evidence that the sand or mixed aggregate having the greatest surface area per unit absolute volume requires more cement and water for a given strength, provided the grading is not too coarse for the given cement content. There is a minimum practicable surface area for given maximum size of aggregate, shape of aggregate particle, and cement content, just as there is a maximum practicable fineness modulus under the same conditions; there must be cement mortar to fill the voids between the particles of aggregates as well as to coat the surfaces of the particles.

Edwards Method of Determining Surface Area

Mr. Edwards' method of determining surface areas of aggregates was as follows:

1. Determination of average apparent specific gravity of particles of dry aggregate.
2. Separation of the aggregate into its component sizes by sieving, and determination of the proportions passing each sieve and retained on the next smaller.
3. Determination of the number of particles per unit weight, by actual count, for each component size.
4. Calculation of the average absolute volume of particle, for each component size, from the known specific gravity and number of particles per unit weight.
5. Determination of the surface area per average particle and per unit weight, for each component size, from the predetermined average volume and shape of particle; the various shape of particles being judged by inspection as spherical, cubical, or parallelepipedal, and, likewise, the proportions of each shape.
6. Determination of the surface area per unit weight of mixed aggregate from the weight proportions and surface areas of the component parts.

Edwards was working with aggregates of the same approximate specific gravity. Under this condition his procedure will give fairly concordant results. As a general method of determining surface area, where the specific gravities of the materials vary within wide limits, it has two fundamental defects—(1) the use of average specific gravity of the whole aggregate in determining surface areas of component parts, and (2) determination of surface area per unit of weight instead of per unit absolute volume of aggregate. The component parts of an aggregate sometimes vary considerably in specific gravity. A given weight of aggregate having a specific gravity of 1.5 contains twice as much absolute volume of solids as the same weight of an aggregate having a specific gravity of 3.0. In other words, the weight of the light-weight aggregate required to make a given volume of concrete is one-half that of the heavier aggregate; and, for the same grading and shape of particles, the lighter aggregate has twice the surface area of the heavier, for equal weights.

Surface Area per Unit Absolute Volume

The surface area should be based on the unit absolute volume of aggregate and, accordingly, the specific gravity of each component part should be determined. Then, the surface areas per unit absolute volumes of aggregates of similar shaped particles can be based on the screen analyses without error due to differences in specific gravity. The utility of the surface area as a basis of proportioning depends upon the approximation of accuracy in its determination; surface area per unit absolute volume is the only definite and fundamental basis, and accuracy of determination depends primarily upon the respective weights and specific gravities determining the absolute volumes of particles of each aggregate and of the component sizes of each aggregate. This basis of surface area offers no special difficulty, but the many and variable shapes of aggregate particles offer perhaps an insurmountable obstacle to reasonably exact determination of the surface area of an aggregate.

Edwards assumed that sand and gravel particles were spherical, and broken stone particles were one-third cubical and two-thirds parallelepipedal, subdividing the latter to approximate more closely the elongated and slab-like shapes of particles. These distinctions are important, since a slab-like particle may have 20 per cent more surface area than a cube, and 50 per cent more than a sphere, for particles of the same absolute volume in each case.

Tensile and compressive strength tests made by Edwards on some 16 sands, all of limestone origin but varying in maximum size of particle and coarseness of grading, show close uniformity of both tensile and compressive strength for a given ratio of cement to surface area of aggregate.

It is obvious that one of the purposes of grading an aggregate is to obtain the maximum coarseness (i. e., minimum surface area) consistent with the cement content and essential workability and cohesion of the mix. The Fuller-Thompson curve, Abrams' maximum practicable fineness modulus, and other systems of grading, are means of obtaining the minimum practicable surface area of aggregate consistent with the given maximum size and the cement content.

Young's Study of Surface Area

Roderick B. Young made a study of the surface area method and presented his analyses in "Some Theoretical Studies of Proportioning Concrete by the Method of Surface Area of Aggregates," *Proceedings*, A. S. T. M., Part II, Vol. XIX, 1919. These theoretical studies by Mr. Young were made preliminary to undertaking experimental proof of the applicability of the method to concrete proportioning.

Young presents evidence to prove that the surface area of an aggregate varies approximately (inversely) as its fineness modulus, although concluding that one bears no mathematical relation to the other. A formula is derived for the quantity of water required (to gauge a mortar or concrete) in relation to the surface area of the aggregate and the cement content. Various test data are analyzed showing quite consistent relations between strength and cement per unit of surface area. Young concludes that these studies appear to offer decisive evidence that the surface area method of proportioning is correct in principle.

In the discussion of Young's paper Abrams shows that there is no mathematical relation between the fineness modulus and surface area of the form $S/m = k$ or $S = km$. This does not prove, however, that there is not a mathematical relation of the form $S = km + n$, as indicated by Young's graphical analysis. Given similarly graded aggregates of the same shaped particles and determining surface area per unit of absolute volume, instead of per unit of weight, this latter relation should hold within the limits of accuracy of measurement of the average diameter by sieve analysis.

Talbot and Richart's Surface Modulus

Talbot and Richart determined the "surface modulus" of the aggregates employed in their Series 2G (*Bulletin* 137, Engineering Experiment Station, University of Illinois). Apparently referring to Series 2G, in discussing Young's paper, Professor Talbot states:

"The tests indicate that for an aggregate having a given maximum size of particles the amount of mixing water required to produce a concrete of a given consistency or mobility is equal to a constant plus a term which is dependent upon the surface area. That I believe is brought out very clearly. The smaller the maximum size of particles, the more the water required. That also is brought out clearly. Now, as to strengths; the tests show that the strengths of these concretes, made up to have the same mobility (and having the same cement content), are also dependent upon the surface area. The results fall nearly in a straight line until an aggregate having a very low surface area (very coarse grading) is reached, a point where the same workability could not be obtained."

Professor Talbot introduced the "surface modulus" in the following words:

"Instead of the actual computed area of the particles I have been using what may be termed a surface modulus. If a series of sieves be used such that the second sieve has a clear space twice as great as the first and each succeeding sieve twice as great as the preceding one (there being little material finer than that which will not pass a sieve half the opening of the finest sieve), and if it be assumed that the mean diameter of the particles that pass a sieve and are retained on the next larger size is twice that of the corresponding particles of the next smaller size, and also that the particles are similar solids both in respect to volume and surface area (as is indicated to be true by the data given by Mr. Young), it can readily be shown analytically that the total surface area of the aggregate is proportional to the sum found by adding the percentage passing the smallest sieve, one-half of the percentage retained on this sieve but passing the next larger sieve, one-fourth of the corresponding percentage between the sieve last named and the next larger, followed with coefficients of one-eighth, one-sixteenth, one-thirty second, etc. If p_1 represents the percentage passing the No. 100 sieve, p_2 that between the No. 100 and No. 48 sieves, following the corresponding percentages between sieves for Nos. 28, 14, 8, 4, etc., to the largest size of the particle, the sum

$$S = p_1 + \tfrac{1}{2}p_2 + \tfrac{1}{4}p_3 + \tfrac{1}{8}p_4 + 1/16p_5 + 1/32p_6 + 1/64p_7, \text{ etc.}$$

will be proportional to the surface area of all the particles (if there is little material finer than the No. 200 sieve), and may be termed the surface modulus. When moduli obtained in this way are plotted against surface area obtained by count and calculation such as those made by Mr. Young and others, the relation is found to be a straight line, indicating that this surface modulus closely represents the surface area of the aggregates."

Where the component parts of the aggregate vary in specific gravity the percentages of each must be taken by absolute volume in order to obtain a surface modulus consistently proportional to the actual surface area. As the method of calculation of the surface modulus ignores the shape of the particles, it is a basis of comparison only for particles of the same general shape. It is like the fineness modulus in these respects.

Summary of Relations

The relations of surface area, fineness modulus and surface modulus, and the respective merits of each, were discussed, in connection with Mr. Young's paper, by G. M. Williams, D. A. Abrams, A. N. Talbot, L. N. Edwards, Watson Davis and R. B. Young. Both surface modulus and fineness modulus are shown in Talbot and Richart's Series 2G. Surface area, surface modulus and fineness modulus are shown by the various laboratories collaborating on the A.S.T.M. Series 201; and they are compared graphically by R. A. Nelson in his analysis of that series. While there appears to be no general agreement on any one relation or merit, the following conclusions are drawn:

(1) There are approximate straight-line relations between fineness modulus, surface modulus and surface area, as indicated by Edwards, Young and Nelson.

(2) The fineness modulus of a single sized particle is an inverse function of the log square of the surface area or surface modulus, as indicated by Abrams.

(3) The relation of fineness modulus to area is varied by variations in maximum size and grading of the aggregate as indicated by Abrams and Talbot.

(4) The relation of fineness modulus to surface modulus is approximately a straight line for similar gradings or for a given value of n in the Talbot-Richart grading equation $p = (d/D)^n$ as indicated by Series 2G.

(5) The relation of fineness modulus to surface modulus is approximately a straight line for uniform gradings of a given maximum size, as indicated by Series 2G.

(6) There is a minimum practicable surface area or surface modulus corresponding to a maximum practicable fineness modulus as indicated by Figures 10 and 11, *Bulletin* 137, by Talbot and Richart.

(7) With a given cement content and consistency of mix, the relation of fineness modulus to strength is more general, for all maximum sizes and gradings, than for the surface modulus, as indicated by Figures 10 and 11, *Bul.* 137.

(8) Excluding the very coarse gradings of Series 2G, the relation of surface modulus to strength is as consistent as for the fineness modulus, as indicated by Figures 10 and 11, *Bul.* 137.

(9) With given cement content and consistency of mix and various maximum sizes of aggregate, as in Series 2G, the relation of *W/C* ratio to fineness modulus is most consistent for *W/C* varying from 0.4 to 1.0, and the relation of *W/C* to surface modulus is most consistent for *W/C* in excess of 1.0, as indicated by Figures 10 and 11, *Bul.* 137.

(10) There is a close relation between surface area and fineness modulus for the usual and practicable mixtures.

Surface modulus is an approximation of the surface area and appears to have no special merit in comparison with the fineness modulus in view of the fact that the fineness modulus is a better indication of the water demand of a mix for the usual consistencies.

The effect of surface area explains partly the effect of fineness modulus. If surface area could be measured accurately it would serve as a supplementary or classifying measure of the fineness modulus.

The fineness modulus has the advantage of simplicity and practicability in the present state of knowledge of the measure of gradation of particles and of the effects of such gradations of diameters or of areas. It is obvious, however, that the surface area has an effect not comprehended by the fineness modulus, and co-ordination of the two measures appears important.

(*To be continued.*)

Colored Concrete Flagstone Walk Is Feature of Mayor's Home

This beautiful flagstone walk, in eight variegated colors, was laid complete in one afternoon. It is the new home of Nicodemus Bosch, mayor of the city of Holland, Mich. Don Lakie is the architect.

The walk was ready for immediate use. When the new lawn has become established and grass appears in the spaces between flagstones as well, the walk will constitute an attractive and inviting approach to the entrance. The stones are placed flush with the surface of the ground, so that a lawn mower will pass directly over them.

Molded concrete flagstone walks in eight variegated colors. Don Lakie, architect

The flagstones were cast in molds and were permanently colored. The molding equipment, the coloring material and the equipment for applying the colors were supplied by the Colorcrete Industries, Inc., Holland, Mich.

HOW TO DO IT

✦ Questions and Answers ✦
Consultation and Comment

A department devoted to the solution of problems encountered in concrete work. Readers are welcome to add to or improve upon the suggestions printed and to submit their views for possible publication.

Cement-Bound Macadam Street Pavements

Can you refer me to a detailed description of construction methods employed in placing cement-bound macadam roads or street pavements?

What is the cost of this type of pavement, and how much cement is required?

I would also like to have your opinion as to whether this type of pavement would be suitable for residential streets.—F. M. W., Coldwater, Mich.

Several methods of construction were employed in placing a number of experimental roads of the cement-bound macadam type in 1932. One approved method of construction was described in an article by U. J. Eckman in the November (1932) issue of CONCRETE, page 8. A method of procedure somewhat different in detail, but essentially the same, is described in an illustrated article in the January (1933) issue, pages 5-6.

The cost of the experimental cement-bound macadam roads placed in 1932 was in the immediate vicinity of $1.00 per cu. yd. An 18-ft. strip of road utilizes about 1,600 bbl. of cement to the mile.

There is no question about the suitability of this type of paving for streets. Obviously any type that is capable of standing up under the high-speed traffic to which paved highways are subjected will be more than ample for residential street traffic.

Reinforced Brickwork Beam Tests

I understand some testing laboratory has made tests of reinforced brick beams and girders, and I would appreciate information concerning the results obtained.—C. R. S., Ogden, Utah.

Tests of beams of reinforced brickwork were conducted at the engineering experiment station of Ohio State University, Columbus, Ohio, in 1932. The results of the tests, including certain conclusions, will be found in an article by J. R. Shank, research professor in civil engineering, in the February (1933) issue of *Engineering Experiment Station News*, published by Ohio State University.

Public Markets

A public market for reinforced concrete construction is contemplated for our city. Can you tell me whether any of the American governmental departments have issued books or pamphlets on the construction, equipment and management of public markets?—J. P. L., Edinburgh, Scotland.

The division of publications, Department of Agriculture, Washington, D. C., has published the following pamphlets on public and roadside markets:

(1) Retail Public Markets, No. 636-Y.

(2) Is the Public Market a Good Civic Investment? No. 73-L.

(3) Roadside Markets, No. 668-L.

The foregoing pamphlets may be obtained at 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C. Orders from countries outside the United States and its possessions should be accompanied by a money order in an amount equal to the price of the pamphlets desired, plus one-third of the total charge, to cover postage.

Influence of Road Types on Cost of Operating Automobiles

Some time ago I read a newspaper article in which reference was made to the cost of operating the average automobile on roads of various types. I am unable to locate this information now, so I am writing you to ask if you can supply me any data on the subject.—R. B. M., Hamilton, Ohio.

It is probable that the newspaper article referred to an estimate prepared by the engineering experiment station of Iowa State College, Ames, Iowa, several months ago. In that estimate the following figures were given as the cost, in cents per mile, of operating the average automobile on the classes of road indicated:

	High Type Roads	Intermediate Types	Low Type Roads
Gasoline	1.09	1.31	1.61
Oil	.22	.22	.22
Tires and tubes	.29	.64	.84
Maintenance	1.43	1.72	2.11
Depreciation	1.26	1.39	1.57
License fees, insurance, garage, interest	1.15	1.15	1.15
Total, in cents per mile	5.44	6.43	7.50

Many motorists who have had extensive experience in driving on roads of low types would place higher figures in the third column for the two items covering maintenance and depreciation.

Details of Concrete Molds

Can you refer me to a complete and worth-while book on making molds for concrete products and cast stone?—J. P. S., Detroit, Mich.

One of the most complete books available on this subject is published under the title of "Molds for Cast Stone and Concrete," by F. Burren and G. R. Gregory. It is sold at $1.25 a copy by the Book Department of CONCRETE.

We are, however, asking manufacturers of concrete molds to send you their catalogs. It is probable that among them you will find the type of mold you want.

Our engineers have perfected special wire ropes for drag line and quarry service that are establishing performance records far beyond our own expectations.

Write us today for specific facts about these new ropes.

You can hardly afford to do without them. They have reduced operating costs for others; why not for you too?

Williamsport Wire Rope Company

Main Office and Works: Williamsport, Pa.
General Sales Offices: 122 South Michigan Avenue, Chicago

This advertisement is to help you get ready for better business

New Books and Pamphlets

Ready-Mixed Concrete Data

Useful information on various phases of the ready-mixed concrete industry has been issued in the form of three printed pamphlets and six mimeographs by the National Ready Mixed Concrete Association. The publications include —

Estimating Quantities for Concrete, by Stanton Walker.

Pre-Mix Concrete from the Viewpoint of the User, by Henry D. Johnson, designing engineer, bureau of bridges and structures, Pittsburgh, Pa.

The Proportioning of Concrete for Strength, Durability, and Impermeability, by A. T. Goldbeck, director, bureau of engineering, National Crushed Stone Association, Washington, D. C.

Central-Mix Concrete in Philadelphia, by H. J. Whitten, Warner Company, Philadelphia, Pa.

Strength Specifications for Ready-Mixed Concrete, by J. L. Shiely, J. L. Shiely Company, Inc., St. Paul, Minn.

Effect of Haul on Strength of Concrete. (Describes results of few tests carried out by J. L. Shiely Company, Inc., St. Paul, Minn.)

Effect of Period of Agitating Ready-Mixed Concrete. (Describes results of tests carried out by Thompson and Lichtner Co., Inc., Boston, Mass., for Boston Concrete Corp.)

Bibliography from Current Periodicals on Ready-Mixed Concrete, prepared by engineering division, National Ready Mixed Concrete Association.

Some Requirements of a Purchase Specification for Ready-Mixed Concrete, by R. B. Young, consulting engineer, Toronto, Ontario, Canada.

Copies of these pamphlets and mimeographs may be obtained on request, by addressing the National Ready Mixed Concrete Association, Munsey Building, Washington, D. C.

Rail-Steel Bars in Highways

Use of Rail-Steel Reinforcement Bars in Highway Construction. Published as Part II of the *Proceedings* of the eleventh annual meeting of the Highway Research Board, 2101 Constitution Ave., Washington, D. C. Paper cover, 91 pages, 6¾ by 9¾ in. Many diagrams and halftone illustrations.

This book is a report of a special investigation made by members of the staff of the Highway Research Board, including R. W. Crum, Fred Burggraf and C. E. Pearce. The data obtained by the investigators, together with their analyses, were submitted to a committee appointed by the executive committee of the Highway Research Board, with R. L. Morrison, professor of highway engineering at the University of Michigan, as chairman. The conclusions printed in the report were drawn by this committee.

Fifteen-Mile Falls Dam

The September (1932) *Journal* of the Boston Society of Civil Engineers, 715 Tremont Temple, Boston, Mass., contains descriptions of the concrete dams and other details of construction of the Fifteen-Mile Falls and the McIndoes Falls power developments, both on the Connecticut River, in Vermont. The first-named development is described by Clarence R. Bliss, and the latter by Harry E. Popp.

ORGANIZATIONS

American Association of State Highway Officials; W. C. Markham, Executive Secretary, 1222-24 National Press Building, Washington, D. C.

American Concrete Institute; Harvey Whipple, Secretary, 641 New Center Building, Detroit, Mich.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 West Grand Ave., Chicago.

American Road Builders' Association; Chas. Upham, Engineer-Director, National Press Building, Washington, D. C.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 West Thirty-ninth St., New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, 1315 Spruce St., Philadelphia, Pa. Annual meeting, June 26-30, Stevens Hotel, Chicago, Ill.

Associated General Contractors of America; E. J. Harding, Managing Director, 222 Munsey Bldg., Washington, D. C.

Building Officials Conference of America; Col. John W. Oehmann, Secretary, 1253 Lawrence St., N. E., Washington, D. C.

Cast Stone Institute; L. A. Falco, Secretary, Chapel St. and Blatchley Ave., New Haven, Conn.

Cement Institute; Luther G. McConnell, General Manager, 11 East 44th St., New York City.

Concrete Masonry Association; Jack Franklin, Secretary, 7071 Plankinton Bldg., Milwaukee, Wis.

Concrete Reinforcing Steel Institute; R. W. Johnson, Secretary, 333 North Michigan Ave., Chicago, Ill.

Engineering Institute of Canada; 2050 Mansfield St., Montreal, Quebec.

Highway Research Board; Roy W. Crum, Director, 2101 Constitution Ave., Washington, D. C.

Joint Committee on Standard Specifications for Concrete and Reinforced Concrete; F. R. McMillan, Secretary, 33 West Grand Ave., Chicago.

National Board of Fire Underwriters; W. E. Mallalieu, General Manager, 85 John St., New York City.

National Concrete Burial Vault Association; J. H. Stuart, Secretary-Treasurer, Bremen, Ohio. Annual meeting, May 18-19, Statler Hotel, Cleveland, Ohio.

National Crushed Stone Association; J. R. Boyd, Secretary, 1735 14th Street, N. W., Washington, D. C.

National Engineering Inspection Association; B. H. Witherspoon, Secretary, P. O. Box 1115, Pittsburgh, Pa.

National Fire Protection Association; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

National Lime Association; Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N. W., Washington, D. C.

National Ready-Mixed Concrete Association; V. P. Ahearn, Secretary, 545 Munsey Bldg., Washington, D. C.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 545 Munsey Bldg., Washington, D. C.

National Slag Association; H. J. Love, Secretary-Treasurer, 1449 Leader Bldg., Cleveland, Ohio.

National Terrazzo and Mosaic Association; U. F. Durner, Secretary, 815 West St. Paul Ave., Milwaukee, Wis. Annual meeting, June 19-22, Palmer House, Chicago, Ill.

Northwest Concrete Products Association; W. P. Hews, Secretary-Treasurer, Yakima, Wash.

Portland Cement Association; Edward J. Mehren, President; William M. Kinney, General Manager, 33 West Grand Ave., Chicago.

Rail Steel Bar Association; H. P. Bigler, Engineering Secretary; Builders' Bldg., 228 N. La Salle St., Chicago, Ill.

Wire Reinforcement Institute; R. D. Bradbury, Director, National Press Bldg., Washington, D. C.

Wisconsin Concrete Products Association; Jack Franklin, Secretary-Treasurer, 425 East Water St., Milwaukee, Wis.

EARN BIG MONEY
MAKING COLORCRETE PRODUCTS

A Complete Home Industry. Profitable

Sell for over 3 times cost to make. Offers quick return and growth. You have a waiting market, protected right in your own territory. Easily made. Your materials cost little and are easily obtained locally.

Why Be Idle?

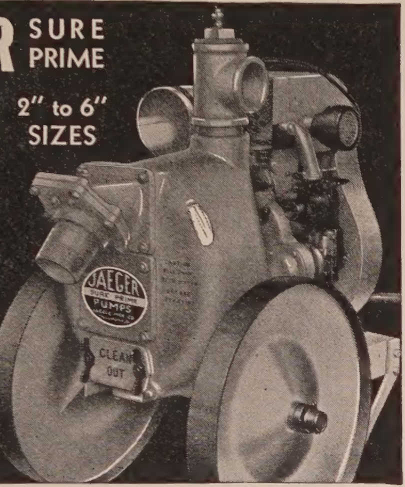
Turn your spare time into profit by making permanent pottery, Art Novelties, Vases, Boxes, Birdbaths, Garden Seats, Flagstones, Fireplaces, Porches, etc. With Colorcrete you can supply these in **30 Colors and Shades.** Beautiful and exclusive designs that sell quickly. We start you right. Franchise Free. Molds cost $20 up. Write today for complete information. Also ask for Machinery catalog for making block, brick and tile.

Colorcrete Industries, Inc.
510 Ottawa Ave. Holland, Mich.

JAEGER SURE PRIME PUMPS 2" to 6" SIZES

$165.00 buys 10,000 Gal. Size Complete

Write for new catalog, new low prices to
The JAEGER MACHINE CO.
522 Dublin Ave.
COLUMBUS, O.



For
FLOWABILITY
Without Additional Water
Use
BARNSDALL ADMIX
(Meta-Colloidal Tripoli Silica)

A Low Water-Factor Admixture of High Purity

97½% Silica

Are you on our mailing list?

BARNSDALL TRIPOLI COMPANY
Former Name American Tripoli Company, Inc. 1892
SUBSIDIARY OF BARNSDALL CORPORATION
Seneca, Missouri
Dealers and Stocks in Principal Cities

"Be Square" Products B (Reg. U. S. Pat. Off.)

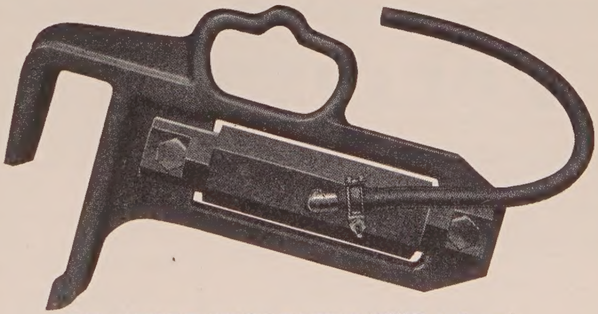
Oneida Cement Colors
COLORS THAT LAST

Uniform, Durable, Pure, and possessed of unusual coloring strength.
Write today for catalog and let us help you with your color problems.

Established 1889

C. J. OSBORN COMPANY
DEPT. B
Manufacturers of Mineral Cement Colors, Waterproofing Compounds, etc.
132 Nassau St., New York
Chicago Rep.: PROCTOR & JOHNSON
327 S. La Salle St. Chicago, Ill.

VIBRATED CONCRETE
BY BRANFORD EQUIPMENT

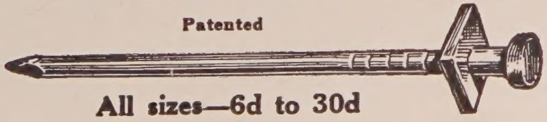


- BRANFORD MOULD VIBRATOR *(above).*
- BRANFORD TABLE VIBRATORS.
- BRANFORD VIBRATOR SPADES *(for concrete in building forms).*
- BRANFORD DOUBLE ATTACHING HEAD VIBRATORS *(for application by customer).*
- BRANFORD CONCRETE PIPE VIBRATOR *(for metal forms).*
- PNEUMATIC VIBRATORS *for Concrete of High Frequency to Suit Any Special Purposes.*

Address Dept. 46
Malleable Iron Fittings Company
Branford, Conn., U. S. A.

This Economy Double-Headed Nail will save you money on formwork

Patented



All sizes—6d to 30d

This nail saves *lumber* and *time* on any job of form work. Its large ½" square guard makes it possible to drive it into the wood as hard as you please without danger of sinking the second head. Holds fast but pulls easily. Let us send you half a dozen nails to try out with your own hammer. Just drop a line to—

THE F. A. NEIDER CO., Inc.
Augusta, Kentucky

Face Interlocking Concrete Units with Brick or Stone

Cost Lower Than by Usual Methods — Marketing Plans Announced

GENUINE facades or veneers of any of the commonly used building materials, such as clay brick, sandstone, limestone, or similar facing materials, may be incorporated into the face of concrete block of any convenient size, through the methods developed by the National Facade Corporation of Pittsburgh, of which Edward M. Ornitz is president.

The illustration shows both the exterior and the interior face of a wall section of these faced units, which are seen to be interlocking. This interlocking feature is accomplished by means of longitudinal grooves along the inside and outside upper edges of the block, and corresponding tongues along the lower edges. These grooves facilitate the placing of the mortar and setting of the block, for any excess mortar is taken care of by adjacent horizontal air spaces. Vertical grooves are provided as a means of obtaining tight vertical joints.

The body of the block may be any type of concrete, preferably of light-weight aggregate. The entire unit is designed so as to take the greatest possible advantage of dead air space for insulating purposes, in addition to the insulating value obtained from the concrete itself.

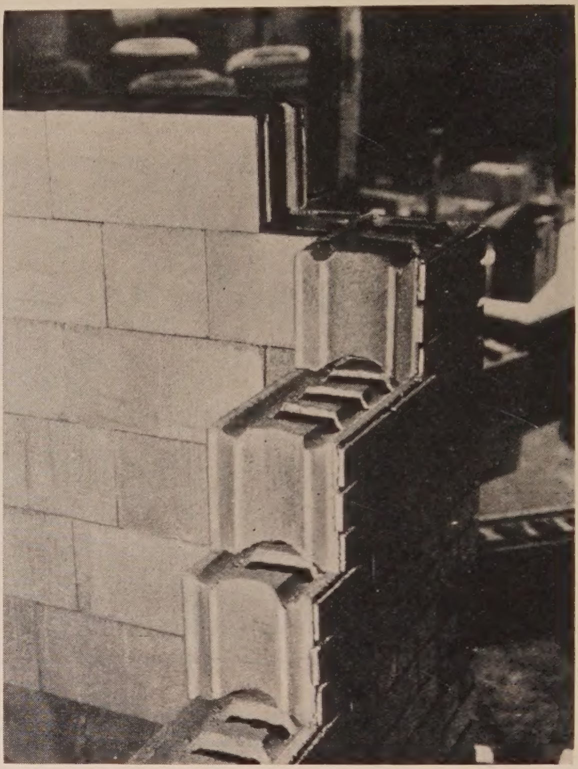
Special units may also be made, such as half blocks, corner blocks, stretchers, jamb blocks, plain face and partition blocks. Combination special units may be made, faced partly with brick and partly with trimstone, for use around door and window openings or at corners.

In all cases where brick or natural stone facing is used, provision is made for mechanical anchorage to the concrete in the body of the block, to take care of unequal expansion and contraction. Tests conducted over a temperature range of 200 deg. F. have indicated no tendency toward breaking away, on the part of the facing material.

It can readily be seen that a facing of clay brick or natural stone may thus be obtained at a large saving in cost as compared with the cost of facing or veneer laid up in the ordinary way by masons on the construction job. Furthermore, the concrete products manufacturer supplies the material for the entire wall, an advantage that will win many a contract that would otherwise be lost.

These faced units can be made on the standard concrete block machines of the poured or tamper types in use today, only minor changes in equipment being necessary.

Marketing plans contemplate the granting of exclusive licenses throughout the United States for the manufacture and sale of these units, supported by a sales and advertising campaign.



New type of interlocking concrete unit is faced with clay brick or natural stone

EQUIPMENT AND MATERIALS

Fully Automatic Weighing Batcher for Mixing Plants Is New Blaw-Knox Product

The Blaw-Knox Co., Pittsburgh, Pa., has placed on the market a full-automatic cement weighing batcher for concrete mixing plants, electrically operated, in a complete range of sizes. These batchers are said to be the last word in mechanization and contain many unique features attributing to accuracy of measurement and long life with low maintenance cost. The Blaw-Knox automatic cement batcher can be attached to Blaw-Knox steel cement storage bins, wood bins or concrete bins. They can be furnished in any size up to and including batchers capable of handling 10,000 lb. of cement per batch, but the popular sizes are 1,000, 2,000 and 3,000-lb. units.

The cement weighing batcher can be equipped, either with beam scales, or with springless dial scales, as desired. Electrical contacts are included with the scale equipment for automatic operation.

The feeder unit, which is attached to the storage bin, consists of a cylindrical rotor with a series of pockets on its circumference. This rotor revolves and takes the cement from the storage bin, dumping it into the cement weighing hopper. Power is furnished by means of a totally enclosed electric motor, with reduction gear built in the head. The reduction gear and motor is enclosed in a single dust-tight cage.

Glencoe Lime Launches "Cobbsment"

Cobbsment is a new mortar whose outstanding quality is the production of leakless masonry, attained through an integral waterproofing combined with the natural density of the mortar.

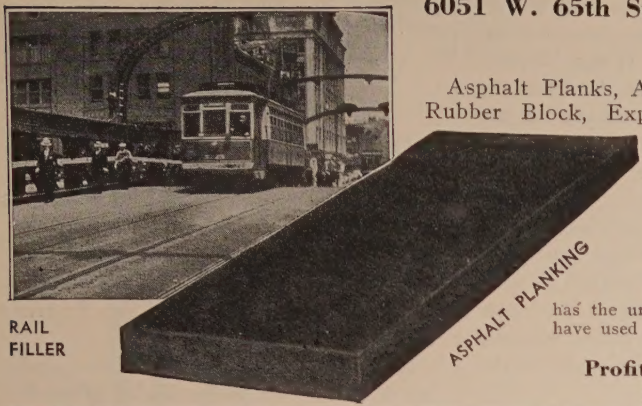
Other features of the new product are its workability, bond strength, and low shrinkage, according to the Glencoe Lime and Cement Co., St. Louis, Mo., by whom it has just been launched.

Broughton Development in Burial Vault Field

Three thicknesses of concrete, one of which is placed at the grave, comprise the

SERVICISED PRODUCTS CORP.

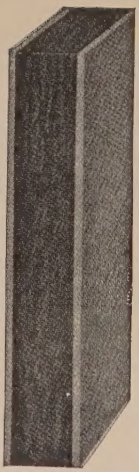
6051 W. 65th St. Chicago, Ill.



Asphalt Planks, Asphalt Tile, Rail Filler, Rubber Block, Expansion Joints, Asphalt Emulsions, Colored Fillers, Cable Trunking.

Servicised Fibrated Asphalt Plank is giving service in hundreds of first class installations. The pioneer of this line Servicised Planking has the unqualified approval of all who have used it. Write for prices today!

Profitable territories open for distributors



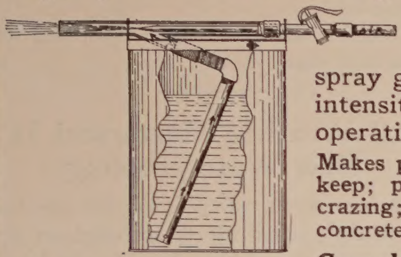
Servicised Felt Reinforced Expansion Joint

In this type of joint reinforced strips of heavy saturated felt are cemented to the core on either side. Joints of this kind are especially serviceable for insert sections in brick and block paving as well as for expansion joint.

Servicised Super Rubber Joint

This sponge rubber product excels in all tests in ageing qualities and resiliency, insuring greater life. Servicised Super Rubber Joint is particularly adapted for sidewalk, curb and gutter, building work, viaducts as well as pavement. The upkeep is reduced to a minimum. Write for prices today!

Spray Cement 1500 Sq. Ft. Per Hour!



Here is an all purpose cement spray gun adjustable for intensity even while in operation.

Makes perfect bond; no upkeep; positively prevents crazing; beautifies colored concrete.

Fully Guaranteed for one year

Complete outfit $15.00
Ten days free trial
Write

Eureka Art Stone Works—Eureka, Cal.

BESSER and ANCHOR

Plain Pallet Strippers pay for themselves in first cost and in operating cost as they make an endless variety of concrete units upon a single set of inexpensive plain Pallets. Now available at any price and capacity desired and with improved features.

Complete sales and service on BESSER, ANCHOR, CONSOLIDATED, IDEAL, HOBBS, UNIVERSAL

Complete equipment for concrete products plants

BESSER MANUFACTURING COMPANY
203 33rd Street Alpena, Michigan

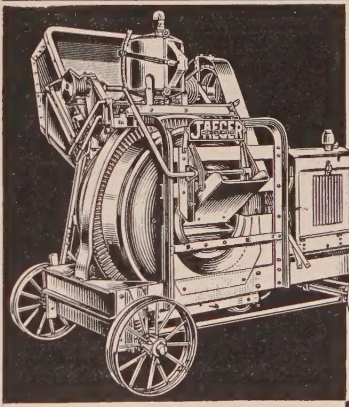
RUBBER MOLDS

It is now possible to produce one and two piece rubber molds for casting Cement, Imitation Marble, Terra Alba, Plaster, etc., into beautiful and useful Lawn Ornaments, and Interior Decorations.

WE ALSO MAKE MOLDS TO ORDER

Write us for further information

THE RUBBER MOLD CO.
1755 Wilcox Holywood, Calif.



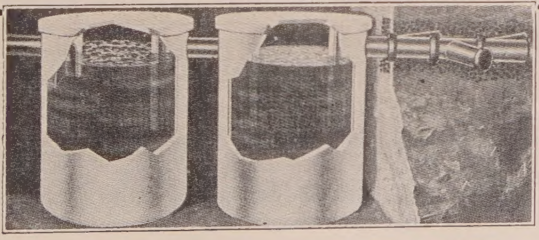
..the BRIDGE BUILDERS MIXERS!

Bridge contractors everywhere are using this faster, easier handling 2-bagger to get more production, push their crews and reduce costs. Improved positive syphon type Water Regulator meets most rigid state specifications. Get our low price.

THE JAEGER MACHINE CO.
522 Dublin Avenue, Columbus, Ohio

$165 f. o. b. Columbus buys Jaeger 10,000 GAL. SURE PRIME PUMP. Complete.

. . . JAEGER 10S MIXER with ACCURATE WATER REGULATOR--Cuts Job Cost



YORK SEPTIC TANK

A Profitable Specialty

Sell the idea of modernizing the home with a septic tank if your prospect is out of the block market. Our patented molds turn out a perfect product, they are easily erected and quickly stripped—York Septic Tanks are not expensive to manufacture and sell for a handsome profit.

SMALL INVESTMENT—EXCLUSIVE TERRITORY

One or more counties—assigned to you with all rights. No royalties; no strings, all profit yours. Worth real money to right man. Send now for FREE book that tells how to make money. Write a postcard

YORK AUTOMATIC SEALING VAULT COMPANY
715 Carlisle Avenue York, Penna.

GIANT Portland Cement

For 45 years the standard among contractors, and engineers who have been responsible for some of the largest concrete construction work in the country.

GIANT PORTLAND CEMENT COMPANY

Pennsylvania Building
Philadelphia, Pa.

370 Lexington Ave.
New York

Everlasting burial vault developed by W. C. Broughton, Kansas City, Mo., under "Autosafe" patents.

Inside the outer vault, which has no top or bottom, is placed a standard six-sided sectional vault. The space of 1½ in. between the two is filled with a rich mix of concrete when both vaults are in place.

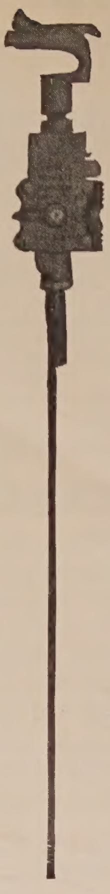
Construction and Strength of Floorgrid

Truscon Floorgrid, designed for use with concrete, consists of rectangular straight bars spaced at definite intervals, with triangular cross bars electro-forged into them.

Floorgrid is designed to function purely as a wearing surface, although it is said to give considerable strength to the construction. It transmits the force of the blow over a large area and protects against the wear of rolling or dragging loads, as well as against the destructive action of loading or unloading heavy articles.

Munsell Vibrating Blade Compacts Internally

Compaction of concrete in hidden places in forms and molds and in areas having closely spaced reinforcing steel are two uses of the new Munsell air-driven Vibrating Blade.



In operation the blade is placed in the concrete as deposited, the vibration permitting the escape of the entrained air and water. It may be operated close to the forms, to eliminate collection of air and water bubbles and bring about smooth surfaces.

Its use is recommended on columns, thin walls, deep girders and beams; in concrete products, for cast pipe, burial vaults, concrete piling, ornamental work, and so on.

The Munsell Vibrating Blade, a product of Munsell Concrete Vibrators, Jersey City, N. J., consists of a half-oval steel bar ½ by 2 in. in section and 3 to 15 ft. long, rigidly attached to the vibrator body.

Model Type C, illustrated, weighs 35 lb. and is portable.

The two other models are Type A, portable, weight 35 lb., equipped with a pronged spud for vibrating flat slabs, shallow beams or girders; and Type B, weight 45 lb., equipped with a vise clamp for rigid attachment to walers or studs.

Westfelt Curing Blanket for Pavements

Constructed to retard hydration for a longer period than ordinary burlap, Westfelt Curing Blanket is said to insure a better and more even job of curing. It may be handled and used repeatedly, on many jobs, over a long period, according to the Insulation Division of the Western Felt Works, Chicago.

It is made of a filler of jute fibres similar to those from which burlap is made, which is punched or needled between two layers of burlap. This, in turn, is coated with rubber latex, to give slight waterproof qualities.

Westfelt Curing Blanket is furnished in standard sizes.

All Weather Masterseal Is New Waterproofing

A transparent waterproofing that may be applied to either wet or dry surfaces at any temperature above freezing has been developed in All Weather Masterseal waterproofing, by the Master Builders Co., Cleveland, Ohio.

NOTES AND NEW CATALOGS

Industrial Literature

Tank Linings

The application of acid, alkali and corrosion resisting linings to industrial equipment, including tanks, is the business of the *Stebbins Engineering and Manufacturing Co.*, Watertown, N. Y.

A description of its service is contained in a bulletin recently issued and entitled *Stebbins Linings*, of which copies are available upon request.

Hoover Dam

Hoover Dam is the title of a 16-page fully-illustrated bulletin just issued by the *Babcock & Wilcox Co.*, New York, N. Y. This new publication describes briefly the Hoover dam project as a whole and in greater detail the gigantic welded plate-steel pipes that are to be fabricated, and installed in the hydraulic power and normal-flow control tunnels, by Babcock & Wilcox.

Heltzel Superior Road Form

Catalog No. 100 of the *Heltzel Steel Form and Iron Co.*, Warren, Ohio, is devoted to Superior lock road forms.

Greater rigidity and easier alignment are possible, due to engineering and practical refinements, it is stated. Contents, including numerous illustrations, give details on these improvements and other features.

Cement Bound Macadam

Cement bound macadam construction is covered in a broadside issued recently by the *Portland Cement Association.*

"Five big reasons why cement bound macadam is the best low cost surface for secondary roads" are presented, largely in picture form.

Expansion Joint Features

The features, installation and manufacture of *Cork-Tex* expansion joint are described in a brochure prepared by the *Bond Manufacturing Co.*, Wilmington, Delaware. Close-up views are included among the installation illustrations.

Chain Belt Appointments

The Chain Belt Co., Milwaukee, Wis., announces the following appointments of distributors: *Ginsberg, Barnes & Conway Co., Inc.*, New York City, in New York state south of and including Sullivan, Ulster and Dutchess counties, greater New York City, and all of Long Island; *R. L. Harrison Co., Inc.*, Albuquerque, N. M., and *Keller Tractor and Equipment Co.*, Detroit.

New Patzig Quarters

The Patzig Testing Laboratories, Des Moines, announce their removal to their own, new building, at 210 11th St.

Larger and more modern facilities are available for testing, analyzing, inspection and research.

Philadelphia Office Opened

Capitol Steel Corp. of New York, fabricators of concrete reinforcing steel products, announce the opening of a branch office at 253 S. 53rd St., Philadelphia, Pa.

The office will be in charge of *E. B. Van Hook*, district engineer.